# REMARKS

## Amendments to the Specification

The above amendment to page 69 of the specification, wherein the term "outlet" was changed to the term --inlet--, is supported by Fig. 17 and by the disclosure in the paragraph beginning on line 14 of page 69.

As seen from Fig. 17, an aqueous ammonia solution flows from the ammonia gas supplier (feeder) 63 into the aqueous ammonia solution reservoir 3 via an ammonia gas-supplying inlet. In this regard, in Fig. 17, see the arrow whish shows the flow of the aqueous ammonia solution into the aqueous ammonia solution reservoir.

## Amendments to the Claims

Minor editorial revisions were made to claims 14 and 18.

Claim 31 was amended to include terminology from claim 31 as set forth in the PRELIMINARY AMENDMENT filed April 14, 2010.

The amendment to claim 46, wherein the term "outlet" was changed to the term "inlet" is supported on page 69 of the specification and Fig. 17 as discussed hereinabove.

Allowed Claims

Applicants are pleased to note that in item no. 10 at the middle of page 9 of the Office Action, it was stated that claims 8, 26, 27, 28, 29 and 36 to 39 were allowed.

It is respectfully submitted that claim 42 should have been included in the list of allowed claims in item no. 10 on page 9 of the Office Action, since claim 42 is indicated as being allowed on page 1, item no. 5 of the Office Action. Also see line 6 from the bottom of page 10 of the Office Action, wherein it is stated that "claims 28-29 [which were allowed] directly depend on claim 12."

With respect to the statement of reasons for the indiction of allowable subject mater in item no. 11 on pages 9 to 10 of the Office Action, no reasons were set forth why claims 37 to 39 were allowable. Claims 37 to 29 are allowable, since claims 37 to 39 depend directly or indirectly on allowed claim 36.

On page 10, line 7 of the Office Action, it is noted that "Claims 1 and 36" should read as follows: -- Claims 8 and 36--.

Anticipation Rejection Under 35 USC 102

Claims 14, 17, 30 to 31 and 44 to 46 were rejected under 35 USC 102 as being anticipated by Yoshimuta (JP 5-279043) for the

reasons set forth in paragraph no. 3 beginning at the middle of page 2 and continuing to the middle of page 4 of the Office Action.

Applicants' Claim 14

It was alleged on page 3, lines 4 to 7 of the Office Action that the aqueous ammonia solution discharger of Yoshimuta has an overflow discharging hole in the circumferential sidewall, and that reference numeral 19 in Figure 1 denotes a solution discharger.

It is respectfully submitted that it is incorrect to identify reference numeral 19 as a solution discharger. Solution discharger 19 denotes a transport pipe for transporting an aqueous ammonia solution drawn from an upper part of the settling tank 13 and returning the drawn aqueous ammonia solution to the bottom of the tank. In other words, the transport pipe is used to circulate the aqueous ammonia solution. This circulation does not decrease the volume of the aqueous ammonia solution in the tank.

Attention is directed to the partial English-language translation of JP 5-279043, which was included in the Information

Disclosure Statement filed on April 17, 2009. Although the English-language translation is indicated to be a "partial" translation, it is essentially a complete translation, because it lacks only a translation of the portion of the [Explanation of Reference Numerals], i.e., all the reference numerals are explained in the specification.

The last three sentences of paragraph [0027] of said English-language translation of JP 5-279043 are as follows:

> "Also, a transport pipe 19 is connected to the settling tank 13. One end of the pipe 19 is connected to the bottom of the tank 13 and the other end to the lateral circumferential wall at an upper location of the part submerged in the aqueous ammonia solution. The aqueous ammonia solution flows upward from the bottom in the tank by a circulation pump 18. "

The last five lines of paragraph [0031] of said English-language translation of JP 5-279043 are as follows:

> "Also, the aqueous ammonia solution in the settling tank 13 is circulated through the transport pipe with the circulation pump 18 and flows upward from the bottom in the tank, which prevents ammonium diuranate particles 15 from accumulating on the bottom and deforming from their own weight."

As understood from the above, the transport pipe 19 of Yoshimuta is not used for discharging the solution, but for circulating the aqueous ammonia solution to prevent ammonium diuranate particles from deforming from their own weight.

In contrast to Yoshimuta, the aqueous ammonia solution discharger of the presently claimed invention serves to maintain the surface of the aqueous ammonia solution such that it does not rise above a predetermined level, and thus maintains constant the distance between the surface of the aqueous ammonia solution and the end(s) of the nozzle(s). As explained in detail in the second full paragraph on page 22 of the present specification, to maintain the aforesaid distance constant is very important because it leads to the production of uniform ammonium diuranate ("ADU") particles without deformation.

Yoshimuta does not teach or suggest anything concerning devices for keeping the aforesaid distance constant, or the advantages resulting from it. Therefore, it is respectfully submitted that applicants' claim 14, as well as the claims dependent thereon, is not anticipated by Yoshimuta.

Applicants' Claim 17

Regarding applicants' claim 17, it was alleged in the Office Action that Yoshimuta discloses that the flow rates of the ammonia gas sprayed from the respective ammonia gas-spraying nozzles are adjustable, wherein reference was made to numeral 7 in Figure 1 and paragraph [0027] of Yoshimuta.

The following is stated in paragraph [0027] of Yoshimuta:

> "For the atomizers 7 may be appropriately employed devices explained under the heading '(2) Method of Forming Drops of Uranyl Nitrate Solution'."

The description under the heading (2), or in paragraphs [0013] and [0014] of Yoshimuta, clearly relates to a step before drops of a uranyl nitrate solution pass through the area between the atomizers 7. Therefore '(2) Method of Forming Drops of Uranyl Nitrate Solution' in paragraph [0027] of Yoshimuta is clearly an obvious error, and should be read as follows: "(3) Method of Gelling the Surface of the Uranyl Nitrate Drops", the description under which is from paragraph [0015] to paragraph [0021] of Yoshimuta.

The flow rate of the ammonia gas is described in paragraph [0020] of Yoshimuta. However, this paragraph teaches only ranges of the flow rate of a mist in relation to that of the uranyl nitrate solution being dripped. In other words, Yoshimuta is silent concerning adjusting the flow rates of sprayed ammonia gas.

Applicants' Claim 30

With respect to applicants' claim 30, it was stated in the Office Action that Yoshimuta discloses that the dripping nozzle device further comprises a single vibrator for vibrating the nozzles simultaneously, and reference was specifically made to paragraphs [0014], [0015] and [0025] of Yoshimuta.

Attention is directed to the aforesaid English-language translation of Yoshimuta.

In paragraph [0014], Yoshimuta teaches to vibrate a dripping nozzle by suitable means at a specified frequency. In paragraph [0025] of Yoshimuta, it is stated that the dripping nozzle 1 is vibrated by an appropriate means. Although paragraph [0033] of Yoshimuta includes the statement that the apparatus may have several dripping nozzles, which may be accompanied by an increase

in the number of atomizers, Yoshimuta does not teach or suggest the employment of a single vibrator for vibrating the nozzles simultaneously.

Applicants' Claim 31

Concerning applicants' claim 31, it was alleged in the Office Action that Yoshimuta's dripping nozzle device further comprises a flow regulator and a volume of each of the drops for each nozzle [sic], wherein the flow regulator has a flow regulator valve and a flowmeter, and attention was directed to paragraph [0014] of Yoshimuta.

There is a statement in paragraph [0014] of Yoshimuta that drops each with a diameter of about 1.2 to 2.8 mm are formed by the dripping nozzle and fall from it. However, Yoshimuta does not teach or suggest anything regarding flow regulators, let alone a flow regulator which contains a flow regulator valve and a flowmeter.

Applicants' Claim 44

With respect to applicants' claim 44, it was alleged in the Office Action that Yoshimuta teaches that the ammonia gas sprayer

is placed above the opening end of the aqueous ammonia solution reservoir, and reference was made to reference numeral 1 of Yoshimuta.

Contrary to this allegation, the ammonia gas atomizers 7 of Yoshimuta are placed under the opening end of the aqueous ammonia solution reservoir (see paragraph [0017] of Yoshimuta and Figure 1 of Yoshimuta). Paragraph [0027] of Yoshimuta begins with the sentence "Atomizers 7 for spraying a mist of an aqueous ammonia solution to the drops are disposed in the lateral circumferential wall of the settling tank 13 below the exhaust vents 5 and above the surface of the aqueous ammonia solution 12 in the settling tank 13." Because the atomizers are disposed in the lateral circumferential wall of the settling tank, which corresponds to an aqueous ammonia solution reservoir, the opening end of the settling tank is naturally above the atomizers (see Figure 1 of Yoshimuta).

Applicants' Claim 45

Regarding applicants' claim 45, it was alleged in the Office Action that Yoshimuta's device further comprises an ammonia gas discharger being placed opposite the ammonia gas sprayer with a

falling path in between, wherein the discharger discharges the sprayed ammonia gas, and reference was made to numeral 10 in Figure 1 of Yoshimuta.

Reference numeral 10 in Yoshimuta denotes a transport tube 10, and not a discharging tube.

Paragraph [0027] in Yoshimuta includes the following disclosure:

> "A transport tube 10 is connected to the lateral circumferential wall of the settling tank 13 at a part submerged in the aqueous ammonia solution. The aqueous ammonia solution 12 is drawn from the tank by a pump 11 and supplied to the atomizers 7. "

The following is stated in paragraph [0022] of Yoshimuta:

> "The aqueous ammonia solution stored in the settling tank should preferably be the same as that sprayed as the mist. It is because this preferable embodiment makes it possible to use an aqueous ammonia solution in such a circulated manner that the aqueous solution is drawn from the settling tank through a transport tube with a pump, sent to the atomizer to be sprayed as a mist, and recovered in the settling tank."

As understood from the above, the transport tube 10 in Yoshimuta is used to transfer an aqueous ammonia solution stored

in the tank to the atomizers 7. Yoshimuta does not teach or suggest to discharge sprayed ammonia gas. The sprayed ammonia gas is received by and collected in the settling tank, so that it is reused to produce drops of ammonia diuranate in the tank (see reference numeral 7 in Figure 1 of Yoshimuta).

Contrary to the aforesaid allegation in the Office Action, the ammonia gas atomizers 7 of Yoshimuta are placed under the opening end of the aqueous ammonia solution reservoir. See paragraph [0027] and Figure 1 of Yoshimuta. Paragraph [0027] of Yoshimuta begins with the sentence:

> "Atomizers 7 for spraying a mist of an aqueous ammonia solution to the drops are disposed in the lateral circumferential wall of the settling tank 13 below the exhaust vents 5 and above the surface of the aqueous ammonia solution 12 in the settling tank."

Because the atomizers are disposed in the lateral circumferential wall of the settling tank in Yoshimuta, which corresponds to applicants' aqueous ammonia solution reservoir, the opening end of the settling tank in Yohimuta is naturally above the atomizers (see Figure 1 of Yoshimuta).

Applicants' Claim 45

Regarding applicants' claim 45, it was alleged in the Office Action that Yoshimuta's device further comprises an ammonia gas discharger being placed opposite the ammonia gas sprayer with the falling path in between wherein the discharger discharges the sprayed ammonia gas, and reference was made to numeral 10 in Figure 1.

Reference numeral 10 in Yoshimuta denotes a transport tube 10, and not a discharging tube.

The following is stated in paragraph [0027] of Yoshimuta:

> "A transport tube 10 is connected to the lateral circumferential wall of the settling tank 13 at a part submerged in the aqueous ammonia solution. The aqueous ammonia solution 12 is drawn from the tank by a pump 11 and supplied to the atomizers 7."

The following is stated in paragraph [0022] of Yoshimuta:

> "The aqueous ammonia solution stored in the settling tank should preferably be the same as that sprayed as the mist. It is because this preferable embodiment makes it possible to use an aqueous ammonia solution in such a circulated manner that the aqueous ammonia solution is drawn from the settling tank through a transport tube with a pump, sent to

> the atomizer to be sprayed as a mist, and recovered in the settling tank."

As understood from the above, the transport tube 10 in Yoshimuta is used to transfer an aqueous ammonia solution stored in the tank to the atomizers 7. Yoshimuta does not discharge sprayed ammonia gas. The sprayed ammonia gas is received by and collected in the settling tank, so that it is reused to produce drops of ammonia diuranate in the tank.

<u>Applicants' Claim 46</u>

Concerning applicants' claim 46, it was erroneously stated in the Office Action that Yoshimuta's ammonia solution reservoir further comprises an ammonia gas-supplying outlet for filling the reservoir with ammonia gas at a location above the surface of the aqueous ammonia solution on the sidewall of the aqueous ammonia solution reservoir. The Office Action referred to numeral 5 in Yoshimuta, which denotes an exhaust vent in Figure 1.

Please see paragraph [0026] in Yoshimuta, which includes an explanation of exhaust vents 5. Ammonia gas in the settling tank 13 in Yoshimuta is discharged from the tank through exhaust vents 5 and the pipes connected thereto (not shown in Figure 1). The

word "exhaust" generally means a pipe on an apparatus that waste gases pass through. Accordingly, it is not understood why the Examiner regarded an "exhaust vent" as something for filling the reservoir with ammonia gas.

<u>Advantages of the Presently Claimed Invention</u>

The aqueous ammonia solution discharger of the presently claimed invention serves to maintain the surface of the aqueous ammonia solution, such that it does not rise above a predetermined level, and thus maintains constant the distance between the surface of the aqueous ammonia solution and the end(s) of the nozzle(s). This constant distance ensures that the reaction between uranyl nitrate included in the drops and the ammonia gas that takes place while the drops are falling from the end(s) of the nozzle(s) to the surface of the aqueous ammonia solution is always carried out under the same conditions. This means that the conditions under which the ammonium diuranate film is formed on the surface of the drops that are about to hit the aqueous ammonia solution, become constant. As a result, uniform ADU particles without deformation are produced. A detailed explanation of this is found in the second full paragraph on page

22 of the present specification.

On the other hand, Yoshimuta does not teach or suggest the technical idea of maintaining constant the distance between the surface of the aqueous ammonia solution and the end(s) of the nozzle(s). The surface level of an aqueous ammonia solution in the settling tank of Yoshimuta will move, depending on the rate at which ammonia is consumed and the rate at which the drops settling in the tank one by one raise the surface level. Therefore, the resultant ADU particles would not be uniform.

Withdrawal of the 35 USC 102 rejection is accordingly respectfully requested.

Obviousness Rejections Under 35 USC 103

Claims 13, 40 to 41 and 43 were rejected under 35 USC 103 as being unpatentable over Yoshimuta (JP 5-279043) in view of Ryota (JP 2000-146993) for the reasons set forth in paragraph no. 7 beginning at the middle of page 5 and continuing to the middle of page 7 of the Office Action.

It was admitted in the Office Action that Yoshimuta does not disclose a continuum irradiator and flow regulators for controlling an amount of the feedstock liquid to be supplied to

each dripping nozzle from a feedstock liquid reservoir in which the feedstock liquid is stored, depending on conditions of the falling of the drops irradiated with the continuum light irradiator; photosensors for sensing the light emitted by the continuum light irradiator and a controller for controlling the flow regulators upon an input of a sensing signal outputted by the photosensors so that the nozzles drip at the same dripping rate, the drops dripped from each nozzle have the same volume, and a drop dripped from one of the nozzles has the same volume as a drop dripped from any other one of the nozzles.

Applicants' Claim 13

It was alleged in the Office Action that the Ryota reference discloses an apparatus for detection of a moving object using continuum light from an irradiated light source (Abstract and Paragraph [0010]) and photosensors for sensing the light emitted by the light irradiator, thus controlling the flow regulator upon an input of a sensing signal outputted by the photosensors, so that the nozzle drips at the same dripping rate, the drops dripped from each nozzle have the same volume, and a drop dripped

from any other one of the nozzles (see paragraph [0013] - photodetector).

Ryota is completely silent about controlling the flow regulator upon an input of a sensing signal outputted by the photosensors so that the nozzle drips at the same dripping rate, the drops dripped from each nozzle have the same volume, and a drop dripped from one of the nozzles has the same volume as a drop dripped from any other one of the nozzles.

The Office Action specifically refers to paragraphs [0010] and [0013] of Ryota. However, neither of these paragraphs teaches or suggests the aforesaid control.

Applicants have provided the following English-language translation of the paragraph [0013] of Ryota, which is referred to in the Office Action:

> "[0013]
>
> According to the invention of claim 2, the acceptance surface is composed of a light receiving element, and variation with time of a project area of the moving object is calculated by regarding the output voltage of the light receiving element in the state which the light source turns off as the output voltage in the state which the acceptance surface (the light receiving element) is covered with the shadow of the moving object."

Applicants do not understand why the Examiner maintained his position regarding Ryota as set forth in the previous Office Action of June 5, 2009. Perhaps the Examiner imagines the control in question from Figure 1 of Ryota, because an inkjet device 1 has several nozzles 1a. Figure 1 of Ryota shows a schematic illustration of the whole device. Reference numeral 7 denotes a signal processor. No feedback/control lines that connect the signal processor 7 and the inkjet device are shown in this figure.

Ryota's invention is focused solely on determining the volume and velocity of a single moving drop, as understood from the abstract thereof. Ryota's invention has nothing to do with the utilization of determined values.

Applicants' Claim 40

With respect to applicants' claim 40, the position was taken in the Office Action that Yoshimuta and Ryota disclose a device for supplying a feedstock liquid according to claim 13, wherein the dripping nozzle device further comprising a single vibrator for vibrating the nozzles simultaneously. The Office Action

specifically referred to paragraphs [0014], [0015] and [0025] of Yoshimuta.

Please see the aforesaid English-language translation of Yoshimuta. In paragraph [0014], Yoshimuta teaches to vibrate a dripping nozzle by suitable means at a specified frequency. In paragraph [0025] of Yoshimuta, it is stated that the dropping nozzle 1 is vibrated by an appropriate means. Although paragraph [0033] of Yoshimuta includes the statement that the apparatus may have several dripping nozzles, which may be accompanied by an increase in the number of atomizers, Yoshimuta does not teach or suggest the employment of a single vibrator for vibrating the nozzles simultaneously.

Applicants' Claim 41

It was stated in the Office Action that Yoshimuta teaches that the dripping nozzle device further comprising a feedstock liquid supplier for supplying the feedstock liquid to the nozzles substantially at a constant flow rate and with pulsation. Reference is made to paragraphs [0014] and [0033] of Yoshimuta as a basis for this allegation.

Please see paragraph [0014] of the aforesaid English-language translation of Yoshimuta. This paragraph teaches that the flow rate of the uranyl nitrate solution <u>discharged from the dripping nozzle</u> is typically from 15 to 30 cc/min. However, Yoshimuta discloses nothing about how a uranyl nitrate solution, the preparation of which is explained in paragraphs [0009] to [0012] of Yoshimuta, is supplied to the dripping nozzle. See paragraphs [0013] and [0014] of Yoshimuta. Paragraph [0033] of Yoshimuta teaches only some possible variations; it is silent about how a uranyl nitrate solution is sent to several nozzles.

<u>Applicants' Claim 43</u>

It was alleged in the Office Action that Ryota's controller converts the detection signals outputted by photosensors into positive pulse signals, and sends a drive-control signal to the corresponding flow regulator when the pulse signals derived from the respective detection signals do not synchronize. It was further alleged that these features are inherently disclosed in Ryota, especially in paragraph [0013].

As explained above, Ryota do not teach or suggest anything concerning controlling a system, but concentrates only on determining the volume and velocity of a single moving drop.

Applicants wonder if the Examiner's position regarding Ryota is imagined from Figure 4 that includes graph (c) showing a negative pulse and graph (d) showing a positive pulse.

Figures 4(a) to 4(e) of Ryota are illustrations showing how the output voltage of the photodetectors, the area of the cast shadow of a singe drop and the diameter of the drop vary as the drop passes across the light path between the light source (3) and the light-receiving surface (4a) composed of photodetectors (4). Graph (c) is plotted with time as the abscissa and the output voltage as the ordinate. In this graph, "P1" denotes a state in which the shadow of a drop comes to the right end of the light-receiving surface (4a), corresponding to the state shown in Figure 3(a). "P2" denotes a state in which the shadow of the entire drop just comes into the light-receiving surface, as shown in Figure 3(b). "P3" denotes a state in which the shadow of the drop comes to the left end of the surface (4a), shown in Figure 3(c); and "P4" denotes a state in which the shadow of the entire drop just goes out of the surface (4a), shown in Figure 3(d).

Graph (d) is plotted with a distance as the abscissa and the area of the shadow of a drop as ordinate. The distance is the length of the path along which the drop moves. In graph (d), the curve starts rising when the shadow of a drop comes to the right end of the light-receiving surface (4a), starts falling when the shadow of the drop comes to the left end of the surface (4a), and returns to the base line when the shadow of the entire drop just goes out of the surface (4a).

In summary, graph (c) shows the relationship between time and the output voltage of the photodetectors (4), while graph (d) shows the relationship between the distance and the area of the shadow. Therefore, although the curve in graph (d) may appear to be a positive pulse, this is not a positive pulse signal converted from a detection signal.

An English-language machine translation of JP 2000-146993 (Ryota) was attached to the previous Office Action of June 5, 2009. However, the last five pages of said English-language machine translation of JP 2000-146993 were missing. Enclosed herewith are the last five pages of said English-language machine translation of JP 2000-146993.

Claim 18 was rejected under 35 USC 103 s being unpatentable over Yoshimuta (JP 5-279043) for the reasons set forth in paragraph no. 8 beginning at the middle of page 7 and continuing to the top of page 8 of the Office Action.

Applicants' claim 18 depends on claim 14. Since for the reasons discussed above, it is submitted that claim 14 is patentable over Yoshimuta, it is respectfully submitted that claim 18 should also be patentable over Yoshimuta.

Claims 32 to 35 were rejected under 35 USC 103 as being unpatentable over Yoshimuta (JP 5-279043) in view of Langen et al. (USP 4,224,258) for the reasons set forth in paragraph no. 9 beginning at the middle of page 8 and continuing to the middle of page 9 of the Office Action.

Applicants' Claim 32

Concerning applicants' clam 32, it was stated in the Office Action that Langen et al. disclose the claimed feedstock container (Figure 2, numeral 16).

Langen et al. show a container 16 for a nitrate solution in Fig. 2. This figure shows that the inner volume of this container is larger than that of the nozzle 2'. However,

although Langen et al. state that a horizontal row of nozzles 2 could be arranged one behind the other in the aspect of Fig. 1 (column 4, lines 41 to 43), Langen et al. do not teach or suggest an arrangement of nozzles in the aspect of Fig. 2. The aspect of Fig. 1 employs a container 15, which is an equivalent to the container 16 in Fig. 2 of Langen et al. Langen et al. do not teach or suggest anything pertaining to the relationship between the inner volume of the container 15 and the inner volume of each nozzle when several nozzles 2 are arranged.

Furthermore, claim 32 id dependent from claim 30, which is, in turn, dependent from claim 14. For the reasons discussed above, it is respectfully submitted that claim 14 is patentable over Yoshimuta. Accordingly, claim 32 should also be patentable.

Applicants' Claims 33 to 35

It was stated in the Office Action that Yoshimuta and Langen et al. teach the features of claims 33 to 35.

Claims 33 to 35 are dependent from claim 32, which is dependent from claim 14. For the reasons stated above, it is respectfully submitted that claim 14 is patentable and therefore claims 33 to 35 are submitted to be patentable as well.

It is respectfully requested that each of the 35 USC 103 rejections be withdrawn.

Reconsideration is requested. Allowance is solicited.

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

Respectfully submitted,

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Encs.: the last five pages of a machine translation of JP 2000-146993 (Ryota) (including paragraphs [0053] to [0066], the Description of the Drawings and the Description of Reference Numerals)

Missing Part of the Computer Translation of

JP 2000-146993 A (Ryota)

[0053]In said embodiment, although what detects movement speed and capacity of an ink drop which are the movable matter objects which move is explained, it is not limited to it and this invention can be applied also to preparation of measuring of medicine, and slight quantity, and a classification of minute objects, such as a micro bead.

[0054]Namely, in the case of the former, as shown in drawing 7, with for example, the discharging device 21 like an ink jet device. By making the medicine 22 breathe out, applying light from the light source 23 to said medicine 22, and carrying out image formation on an acceptance surface of the photo detector 25 via the lens means 24 like a device mentioned above. Capacity of the medicine 22 which fly the air with this device can be measured, it can store in the container 26, and measuring of a slight quantity of the medicine 22 in which it is difficult to measure weight is attained. Therefore, if it is made to stop regurgitation when a stipulated amount is reached on the occasion of preparation, it can be used for preparation of slight quantity. A micro bead breathed out from the discharging device 31 as shown in drawing 8 in the case of the latter, By applying light to the minute objects 32, such as a micro bearing, from the light source 33, and making them carry out image formation on an acceptance surface of the photo detector 35 via the lens means 34 similarly. Every one minute object 32 with various capacity can be measured with the device, and it is possible to respond to capacity (size), and to sort out and classify by dividing the containers 37a and 37b to store, by air injection from [ from capacity information acquired by it ] the air nozzle 36, etc.

[0055]

[Effect of the Invention]This invention is carried out with a gestalt which was explained above, and does so an effect which is described below.

[0056]The invention of claim 1 via said movable matter object towards the acceptance surface which has two parallel straight parts, the 1st and the 2nd, which abbreviated-intersect perpendicularly with the moving trucking of a movable matter object, Since he is trying to compute the movement speed and capacity of said movable matter object by irradiating with light from a light source and said movable matter object considering that it is a solid of revolution symmetrical with an axis about the medial axis of the move direction based on change of the project area of the movable matter object in said acceptance surface, Easily, the movement speed and capacity of a movable matter object are immediately

detectable together.

[0057]Since the invention of claim 2 constitutes the acceptance surface with the photo detector, it can be constituted easily, Since it is supposing that it is the output voltage of the photo detector in the state where the light source was switched off the output voltage at the time of being in the state where all acceptance surfaces (photo detector) were covered in the shadow, the temporal change of a project area with a movable matter object is easily computable on the basis of it.

[0058]It is detecting the time taken for a movable matter object to move the invention of claim 3 to the 2nd straight part from the 1st straight part of an acceptance surface, and doing division of the distance between the 1st and 2nd straight parts in time to pass through between them, While computing the movement speed of said movable matter object, after asking for the expression of relations of the migration length of a movable matter object and the project area between said 1st and 2nd straight parts, It is differentiated and it asks for the expression of relations of migration length and a radius, and since he is trying to compute the capacity of a movable matter object, the movement speed and capacity of a movable matter object are immediately detectable [ by change of the project area of the movable matter object in an acceptance surface ] by carrying out rotation integration of the expression of relations at axial symmetry, together easily.

[0059]The invention of claim 4 determines the project area about the 1st of minute width which has the 1st and 2nd straight parts, respectively, and the 2nd light-receiving portion, It asks for the expression of relations of the migration length of said movable matter object, and a radius based on this, and by carrying out rotation integration of this expression of relations at axial symmetry, since he is trying to compute the capacity of a movable matter object, the capacity of a movable matter object is easily computable.

[0060]The invention of claim 5 carries out the A/D conversion of the output voltage of the photo detector corresponding to change of the project area of the movable matter object on the basis of the time of the shadow of a movable matter object passing through the 1st and 2nd straight parts of a photo detector, Based on the voltage waveform produced by carrying out an A/D conversion, it considers that said movable matter object is a solid of revolution symmetrical with an axis about the medial axis of the move direction, Since the movement speed of a movable matter object is detected from the time taken to pass through between the 1st and 2nd straight parts of said photo detector while computing the capacity of said movable matter object, the capacity and movement speed of a movable matter object are easily computable.

[0061]It is made for the invention of claim 6 to output the voltage to which said photo detector is proportional to the incident light quantity from said light source linearly, Since output voltage of the photo detector in the state where the light source was switched off is made into the output voltage at the time of being in the state where all photo detectors were covered in the shadow and he is trying for a calculating means to compute by making it into a reference value, an operation becomes simple.

[0062]The invention of claim 7 carries out the compensation process of the signal from said photo detector to the signal which is proportional to incident light quantity in a correction circuit, and since he is trying for a calculating means to compute the output voltage of the photo detector in the state where the light source was switched off, as a reference value which is in the state where all photo detectors were covered in the shadow, an operation becomes simple.

[0063]On the acceptance surface of a photo detector, since the invention of claim 8 is made to carry out image formation to being also at fixed magnification about the projection picture of said movable matter object, it can detect easily change of a project area with a movable matter object.

[0064]Since he is trying for the invention of claim 9 to compute the speed of a movable matter object by doing division of the distance between the straight parts of said photo detector to it being also in time after a movable matter object passes through one straight part until it passes through the straight part of another side by a calculating means, detection of the movement speed of a movable matter object is easy for it.

[0065]The invention of claim 10 is making the output voltage of a photo detector equivalent to the project area of a movable matter object, and carrying out the multiplication of the time to said speed by the project area change primary detecting element of a calculating means, It is detected by change of the project area to the migration length of a movable matter object, and by an area primary detecting element. Since the project area of the movable matter object per unit distance is determined, and he is trying for said movable matter object to compute the capacity of a movable matter object by a capacity primary detecting element further by considering that it is a solid of revolution symmetrical with an axis about the medial axis of the move direction, the capacity of a movable matter object is easily detectable.

[0066] [0066]By a diameter detection means, the invention of claim 11 does division of the project area to the 1st element by the width of the 1st element among photo detectors, detects the diameter of a movable matter object, and by a distance detecting means. Carry out the multiplication of time to pass said 1st element and the speed, detect the migration length over the portion of said diameter, and further by a capacity detection means. Since said movable matter object is computing the capacity of a movable matter object by considering that it is a solid of revolution symmetrical with an axis about the medial axis of the move direction, the capacity and movement speed of a movable matter object are easily computable.

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[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

## DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a perspective view showing the outline composition of the drop sensing device which is an example of the movable matter object sensing device concerning this invention.
[Drawing 2]It is a flow chart showing the flow of operation of the device.
[Drawing 3](a) - (d) is an explanatory view showing the relation between the shadow of a drop, and the acceptance surface of a photo detector, respectively.
[Drawing 4](a) - (e) is an explanatory view showing change of the output voltage of the photo detector by passage of a drop, a project area, and a diameter, respectively.
[Drawing 5]It is an explanatory view in which other embodiments about a photo detector are shown.
[Drawing 6](a) - (c) is an explanatory view showing change of the output voltage of the photo detector by passage of an ink drop, a project area, and a diameter, respectively.
[Drawing 7]It is an explanatory view of a modification.
[Drawing 8]It is an explanatory view of a modification.
[Description of Notations] → Reference Numerals
1 Ink jet device
1a Nozzle
2 Ink drop (movable matter object)
2A The shadow of an ink drop
3 Light source
4 Photo detector
4a Acceptance surface → Light-receiving surface
4b The 1st straight part
4c The 2nd straight part
5 Lens means
6 A/D conversion means
7 Signal processing means
11A The 1st element
11B The 2nd element
11a The 1st straight part

11b The 2nd straight part

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[Translation done.]